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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 02F065-PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/JP 03/00161	International filing date *(day/month/year)* 10.01.2003	Priority date *(day/month/year)* 11.01.2002
International Patent Classification (IPC) or both national classification and IPC H02M3/335		
Applicant SANKEN ELECTRIC CO., LTD.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
27.06.2003	13.05.2004
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Marannino, E. Telephone No. +31 70 340-3906

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/JP 03/00161

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-21 as originally filed

Claims, Numbers

11 received on 05.12.2003 with letter of 05.12.2003

2, 4, 6, 7, 9 received on 31.03.2004 with letter of 29.03.2004

Drawings, Sheets

1/9-9/9 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

☐ the description, pages:

☒ the claims, Nos.: 1,3,5,8,10

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2,4,6,7,9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	2,4,6,7,9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	2,4,6,7,9
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V
Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document:

D1: US-A-5689407

The present international application relates to a DC-DC converter operated in normal mode and standby mode.

does not fulfil the requirements of Article 33(3) PCT because claim 1 is not inventive.

Novelty
Document D1 (Fig. 1) which is considered the closest prior art for claim 1 discloses a power source apparatus comprising:
- a conversion circuit (2a, 1, S1, T, D2, 2b) which performs conversion of an input voltage (Vdc) into an output voltage (Vo2) different from the input voltage; and a driving power source (Cs) which is charged with the input voltage to drive said conversion circuit, wherein: said conversion circuit includes:
- a transformer (T) which has a primary winding (Lp) and a secondary winding(Ls2) which are inductively coupled to each other,
- a switching circuit (2a, 1, S1) which applies the input voltage to said primary winding intermittently,
- a rectifier circuit (D2) which rectifies a voltage which is induced in said secondary winding, and
- detection circuit (2b) which detects that the standby signal is supplied, and supplies a detection signal representing a detection result to said switching circuit via a predetermined signal line;
- a feedback circuit (LS, D5, Rv, C5) which generates a feedback signal and supplies the generated feedback signal to the switching circuit via **a second** signal line.
- said switching circuit determines whether or not said detection circuit detects the standby signal.

Moreover D1 discloses (feature 3*) that
- in a case where determining a standby signal is not detected, said switching circuit starts

applying the input voltage intermittently when a voltage of said driving source power source rises a **turn- on voltage Von**, stops the applying the input voltage when the voltage of said driving power source lowers to **a first turn- off voltage Voffn**, and sets timings of intermittence of the input voltage based on the feedback signal so that the output voltage may be stabilised at a predetermined first value (Vo2);
- in a case where determining the standby signal is detected, said switching circuit so e stabilises the output voltage at equal or lower than a predetermined second value which is lower than the predetermined first value, by starting applying the input voltage intermittently when a voltage of said driving power source rises to the **same turn-on voltage Von** and by stopping applying the input voltage when the voltage of said driving power source lowers to **a second turn- off voltage Voffs**, that is lower than the first turn-off voltage.
Thus subject-matter of claim 2 is new and it fulfills the requirements of Article 33(2) PCT.

Inventive step
Subject-matter of claim 2 differs from document D1 for the three following features:

1) the feedback signal comprises a current that increases as the output voltage increases

2) the feedback circuit supplies the generated feedback signal to the switching circuit via **said predetermined** signal line.

3)- in a case where determining a standby signal is not detected, said conversion circuit starts applying the input voltage intermittently when a voltage of said driving source power source rises **a first turn-on voltage $Vccon_1$**, stops applying the input voltage when the voltage of said driving power source lowers to **predetermined voltage Vcccoff**, and sets timings of intermittence of the input voltage based on the feedback signal so that the output voltage may be stabilised at a predetermined first value;

- in a case where determining the standby signal is detected, said conversion circuit stabilises the output voltage at equal to or lower than a predetermined second value which lower than the first value, by starting applying the input voltage intermittently when a voltage of said driving power source rises to the **a second turn-on voltage $Vccon_2$** which is lower than the turn-off voltage, and by stopping applying the input voltage when the voltage of said driving power source lowers to **the turn- off voltage Voffs.**

Therefore the turn-off voltage Vccoff keeps the same value during normal mode and standby, on the other hand the turn on voltage Vccon assumes two different value in normal mode ($Vccon_1$) and standby mode ($Vccon_2$) (feature **3**).

The problems solved by the present invention can be considered as:
A) provide a less fluctuant DC voltage to a load, even in standby (solved by feature **3**)
B) simplify the control circuit of D1 and reduce the members of the pins of the output of control circuit. (solved by features **1,2**).

The man skilled in the art confronted with the first task of reducing voltage fluctuation in standby mode (B) knows that any equivalent way to reduce the difference Δ between the turn-on level and the turn-off level would be applicable to obtain such DC voltage with reduced fluctuations. Thus for the skilled person feature **3** is a straightforward alternative to feature **3*** for reducing Δ.
Even if t the skilled man would apply the third feature without involve an inventive activity, the man skilled in the art confronted with the second problem of simplify the control circuit and reducing the pins output (problem B) would not arrive at the subject-matter of claim 2. Prior art D1 teaches away from the present invention, because the control unit of D1 is performed based on two signals Vf and Vfb which are supplied via two different signal lines moreover these signal are not obtained in the same via as in the application.
The man skilled in the art would not be prompted to abandon the teaching of D1 and therefore subject-matter of claim 2 is inventive (Article 33(3) PCT).

Claim 7 is also new and inventive because it differs from claim 2 only in that the wording "a coil" replaces the formulation "a transformer which has a primary winding and a secondary winding which are inductively coupled to each other". Thus the same reasoning in paragraph 1 can applied to claim 7.

As already mentioned the power source apparatus of claim 2 and 7 finds application on DC-Dc converter on electrical/electronic equipment, therefore the industrial applicability of claims 2 and 7 is beyond any doubt.
Therefore claims 2 and 7 meet also the requirements of Article 33(4) PCT.

Since remaining claims 4,6 and 9 are dependent on respectively on claim 2 and claim 7,

they also meet the requirements of Articles PCT (33(2) 33(3) 33(4)).

CLAIMS

1.(Deleted)

2.(Amended) A power source apparatus comprising: a conversion circuit (40, 60, 34, 32, 91, 100, 80) which performs conversion of an input voltage into an output voltage different from the input voltage; and a driving power source (33) which is charged with the input voltage to drive said conversion circuit (40, 60, 34, 32, 91, 100, 80),

wherein: said conversion circuit (40, 60, 34, 32, 91, 100, 80) includes

a transformer (32a, 32b) which has a primary winding and a secondary winding which are inductively coupled to each other,

a switching circuit (40, 60, 34, 80) which applies the input voltage to said primary winding intermittently,

a rectifier circuit (91) which rectifies a voltage which is induced in said

secondary winding,

a detection circuit (100) which detects that a standby signal is supplied, and supplies a detection signal representing a detection result to said switching circuit (40, 60, 34, 80) via a predetermined signal line; and

a feedback circuit (104, 105) which generates a feedback signal comprising a current that increases as the output voltage increases, and which supplies the generated feedback signal to said switching circuit (40, 60, 34, 80) via said signal line;

said switching circuit (40, 60, 34, 80) determines whether or not said detection circuit (100) supplies the detection signal representing that the standby signal is detected;

in a case where determining that the standby signal is not detected, said switching circuit (40, 60, 34, 80) starts applying the input voltage intermittently when a voltage of said driving power source (33) rises to a first turn-on voltage, stops applying the input voltage when the voltage of said driving power source (33) lowers to a predetermined turn-off voltage, and sets timings of intermittence of the input voltage based on the feedback signal so that the output voltage may be stabilized at a predetermined first value; and

in a case where determining that the standby signal is detected, said switching circuit (40, 60, 34, 80) stabilizes the output voltage at equal to or lower than a predetermined second value which is lower than the first value, by starting applying the input voltage intermittently when the voltage of said driving power source (33) rises to a second turn-on voltage which is lower than the first turn-on voltage and higher than the turn-off voltage, and by stopping applying the input voltage when the voltage of said driving power source (33) lowers to the turn-off voltage.

3.(Deleted)

4.(Amended) The power source apparatus according to claim 2,

wherein: said detection circuit (100) supplies the feedback signal as the detection signal, by controlling said feedback circuit (104, 105) so that a value represented by the feedback signal may be a predetermined value,

in response to that the standby signal is supplied; and

said switching circuit (40, 60, 34, 80) determines whether or not said detection circuit (100) detects the standby signal, based on the value represented by the feedback signal.

5. (Deleted)

6. The power source apparatus according to claim 2, further comprising:

a tertiary winding (32c) which is inductively coupled to said primary winding; and

an auxiliary rectifier circuit (35) which rectifies a voltage induced in said tertiary winding (32c),

wherein said driving power source (33) is also charged with a voltage obtained by rectification by said auxiliary rectifier circuit (35).

7.(Amended) A power source apparatus comprising: a conversion circuit (40, 60, 34, 32, 91, 100, 80) which performs conversion of an input voltage into an output voltage different from the input voltage; and a driving power source (33) which is charged with the input voltage to drive said conversion circuit (40, 60, 34, 32, 91, 100, 80),

wherein: said conversion circuit (40, 60, 34, 32, 91, 100, 80) includes

a coil (111),

a switching circuit (40, 60, 34, 80) which applies the input voltage to said coil (111) intermittently,

a rectifier circuit (91) which rectifies a voltage induced in said coil (111),

a detection circuit (100) which detects that a standby signal is supplied, and supplies a detection signal representing a detection result to said switching circuit (40, 60, 34, 80) via a predetermined signal line; and

a feedback circuit (104, 105) which generates a feedback signal comprising a current that increases as the output voltage increases, and which supplies the generated feedback signal to said switching circuit (40, 60, 34, 80) via said signal line;

said switching circuit (40, 60, 34, 80) determines whether or not said detection circuit (100) supplies the detection signal representing that the standby signal is detected;

in a case where determining that the standby signal is not detected, said switching circuit (40, 60, 34, 80) starts applying the input voltage intermittently when a voltage of said driving power source (33) rises to a first turn-on voltage, stops applying the input

voltage when the voltage of said driving power source (33) lowers to a predetermined turn-off voltage, and sets timings of intermittence of the input voltage based on the feedback signal so that the output voltage may be stabilized at a predetermined first value; and

in a case where determining that the standby signal is detected, said switching circuit

(40, 60, 34, 80) stabilizes the output voltage at equal to or lower than a predetermined second value which is lower than the first value, by starting applying the input voltage intermittently when the voltage of said driving power source (33) rises to a second turn-on voltage which is lower than the first turn-on voltage and higher than the turn-off voltage, and by stopping applying the input voltage when the voltage of said driving power source (33) lowers to the turn-off voltage.

8.(Deleted)

9.(Amended) The power source apparatus according to claim 7,

wherein: said detection circuit (100) supplies the feedback signal as the detection signal, by controlling said feedback circuit (104, 105) so that a value represented by the feedback signal may be a predetermined value, in response to that the standby signal is supplied; and

said switching circuit (40, 60, 34, 80) determines whether or not said detection circuit (100) detects the standby signal, based on the value represented by the feedback signal.

10.(Deleted)